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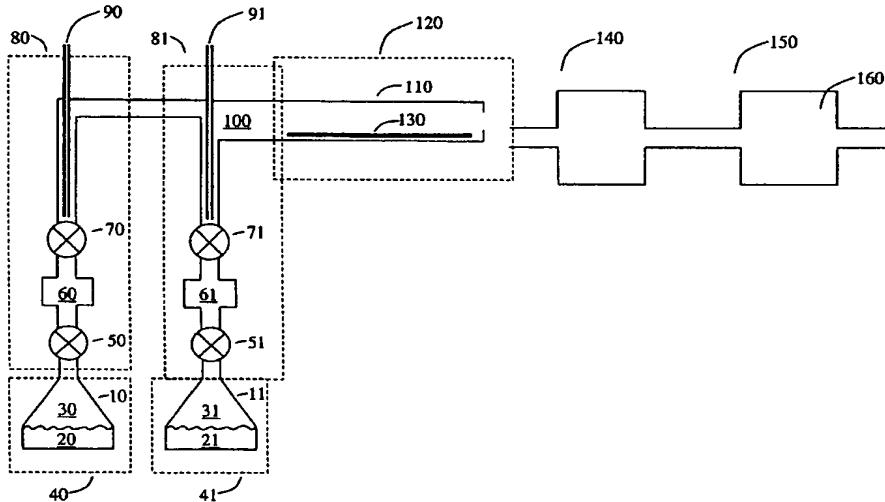
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(72) Inventors; and

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(54) Title: VAPOR DEPOSITION OF OXIDES, SILICATES AND PHOSPHATES



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(57) Abstract: Metal silicates or phosphates are deposited on a heated substrate by the reaction of vapors of alkoxy silanols or alkyl phosphates along with reactive metal amides, alkyls or alkoxides. For example, vapors of tris-(ter-butoxy)silanol react with vapors of tetrakis(ethylmethylamido)hafnium to deposit hafnium silicate on surfaces heated to 300 °C. The product film has a very uniform stoichiometry throughout the reactor. Similarly, vapors of diisopropylphosphate react with vapors of lithium bis(ethyldimethylsilyl)amide to deposit lithium phosphate films on substrates heated to 250 °C. Supplying the vapors in alternating pulse produces these same compositions with a very uniform distribution of thickness and excellent step coverage.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 01/30507

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C23C16/40 C23C16/44

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

PAJ, WPI Data, EPO-Internal, INSPEC, IBM-TDB, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 560 617 A (KAWASAKI STEEL CO) 15 September 1993 (1993-09-15) page 5, line 29 - line 41 page 20, line 1 - line 32 ---	1,3,4
X	DE 43 16 883 A (DENK MICHAEL DR) 24 November 1994 (1994-11-24) claims 2,37 ---	22-24
X	US 4 792 463 A (OKADA MASARU ET AL) 20 December 1988 (1988-12-20) example 4 ---	1,10 -/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the International filing date
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- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the International filing date but later than the priority date claimed

- *T* later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the International search

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19.08.02

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	IKEDA Y ET AL: "OZONE/ORGANIC-SOURCE APCVD FOR ULSI REFLOW GLASS FILMS" NEC RESEARCH AND DEVELOPMENT, NIPPON ELECTRIC LTD. TOKYO, JP, no. 94, 1 July 1989 (1989-07-01), pages 1-7, XP000067542 ISSN: 0547-051X figure 1 ---	1,11
X	WO 97 38355 A (MICRION CORP) 16 October 1997 (1997-10-16) page 3, line 4 - line 9 ---	22
X	WO 99 29924 A (NESTE OYJ ;SUNTOLA TUOMO (FI); LESKELAE MARKKU (FI); RITALA MIKKO) 17 June 1999 (1999-06-17) page 5, line 4 - line 13 ---	28
Y	US 5 389 401 A (GORDON ROY G) 14 February 1995 (1995-02-14) column 2, line 38 -column 4, line 13 ---	29,30
Y	WO 99 29926 A (SIEMENS AG ;ADVANCED TECH MATERIALS (US)) 17 June 1999 (1999-06-17) page 10, line 3 -page 11, line 10 page 14, line 15 -page 16, line 2 ---	30
A	COLTRIN M E ET AL: "Chemical kinetics in chemical vapor deposition: growth of silicon dioxide from tetraethoxysilane (TEOS)" THIN SOLID FILMS, ELSEVIER-SEQUOIA S.A. LAUSANNE, CH, vol. 365, no. 2, April 2000 (2000-04), pages 251-263, XP004197205 ISSN: 0040-6090 paragraphs '0004!, '0006! ---	1-11
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 227 (E-1360), 10 May 1993 (1993-05-10) & JP 04 359515 A (NEC CORP), 11 December 1992 (1992-12-11) abstract ---	2,4-11
A	WO 98 15669 A (FELTS JOHN T) 16 April 1998 (1998-04-16) page 18, line 1 - line 20 -----	28-30

INTERNATIONAL SEARCH REPORTInternational application No.
PCT/US 01/30507**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

1-11, 22-24, 28-30

4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-11,22-24

CVD process using alkoxysilan(di)ol.

2. Claims: 12-21,25

CVD process using bis(alkyl)phosphates.

3. Claims: 26,27,31,32

CVD process using arene hydrates.

4. Claims: 28-30

CVD process using amides and alcohol or water.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/30507

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